

REMARKS

Claims 1-12 are pending in the application, claims 13-30 having been canceled without prejudice in applicant's response submitted on February 26, 2003. Claims 1-12 are rejected under 35 U.S.C. §103.

The present invention is directed to a process for manufacturing a polymer fiber composite tube clamp in which a continuous fiber-reinforcing material is layered in a single layup and cured in a single curing operation. An important aspect of the invention is that the continuous fiber-reinforcing material is layed up to the contour of the layup tooling. The continuous fiber-reinforcing material adjacent to the part to be clamped is planar, with the fibers lying in a plane that is parallel to the surface of the clamp. This is an important aspect of the invention, since when the fibers are layed up to the contour of the tooling, that is, in a plane parallel to the surface of the clamp, they do not project out of this plane and to the surface of the clamp. Because the molded tube clamp is not machined to its final contoured shape after molding, no fiber ends are exposed. These factors prevent exposed fiber ends, which abrade and cause wear on the clamped tube. Additionally, the molded tube clamp, not being machined, is less likely to delaminate or crack, because the predetermined layup can take advantage of the directional strength of the planar sheets of material.

Claims 1-5 and 10-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Wiley (U.S. Patent No. 4,435,506) in view of Alston et al. (U.S. Patent No. 6,103,864), Livesay et al (U.S. Patent No. 5,837,185) and the admitted prior art. The Examiner states:

Wiley discloses forming tube clamps by compression molder fiber-reinforced polymer in the shape of a tube clamp and then removing the shaped material from the mold (Col. 3, ll. 44-57). While the reference discloses polyamide, a thermoplastic, the material listed, PMR-15, is a mixture of polyimide and carbon fibers as shown by Alston et al. (Col. 1, ll. 33-36). Clearly, the use of Polyamide rather than polyimide is a spelling mistake in Wiley. Thus, the material used, PMR-15, is a thermosetting material, i.e. is curable. One in the art would understand that the material was cured, as that is how thermosetting materials are used.

Wiley is silent as to whether one or more layers of material are used to form the tube clamp. However, using one or more sheets of fibers to form a composite is well-known per se in the composite molding arts as shown for example by Livesay et al. which discloses one or more fiber sheets can be laid-up in a mold to form a structure (Col. 4, ll. 12-17) and by the admitted prior art which discloses forming a tube clamp from multiple layers of material (Pg. 2-3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use multiple fiber layers as it is known in general in the molding arts to use one or more layers of fibers to form a product as shown for example by Livesay (Col. 4, ll. 12-17) particularly in view of the admitted prior art which discloses it is known to make tube clamps from multiple layers of material. (Pg. 2-3)

Regarding claims 2 and 3, while Wiley discloses randomly oriented fiber layers, this is clearly only exemplary and not integral to the method of clamp formation. Livesay et al. discloses the fiber layers can be unidirectional, woven fabric or felt (randomly oriented fiber layers). (Col. 4, ll. 12-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the fiber layer of Wiley with unidirectional or woven fabric layers as Livesay et al. indicates these are well-known alternatives in the art. (Co. 4, ll. 12-17).

Regarding claim 4, Wiley discloses randomly oriented fiber layers. (Col. 3, ll. 49-50).

Regarding claim 5, the sheet is formed from graphite fiber with polyimide resin. (Wiley, col. 3, ll. 49; Alston et al., Col. 1, ll. 33-36).

Regarding claims 10 and 11, Wiley discloses the clamp is compression molded. (Col. 3, ll. 50-51) but does not disclose the exact type of apparatus used. Livesay et al. discloses products can be formed by laying up dry fiber mats, impregnating them with resin, and autoclaving them. (Col. 1, ll. 29-39). It would have been obvious to one of skill in the art at the time the invention was made to layer up dry fiber layers, impregnate them with resin, and autoclave them, since Livesay et al. Discloses this method forms structures with high strength-to weight ratios (Col. 1, ll. 16-20) as would be required for a clamp.

Regarding claim 12, Wiley discloses the process to make a clamp. One in the art would understand that a clamp would have two halves, both made via the same molding technique.

Applicant has already acknowledged that Wiley is presumably a typographic error. Applicant's position is that the cited art does not technically disclose the claimed invention. Applicant further notes that even if the cited art did technically disclose the claimed invention, the art does not meet the legal requirements for combining references.

Wiley, as understood, discloses a tube clamp for use with gas turbine engines. The examiner is correct in stating that Wiley is silent as to one or more layers, because

Wiley at column 3, lines 44-50 clearly teaches away from sheets or layers. Wiley specifically teaches the use of PMR-15 with randomly oriented graphite material that is continuously molded by compression molding into the configuration needed. The continuous molding using compression molding disclosed by Wiley teaches away from the use of layers, as taught by applicant. Applicant refers the Examiner to ASM Handbook Volume 21, COMPOSITES p. 516 for a complete discussion of compression molding. Wiley teaches or suggests no other method. That Wiley does not recognize the problem solved by the present invention is also evidenced with reference to Fig.1 of Wiley, which requires the use of a grommet 12, which will be interposed between the clamp and the tube. The grommets are unexplained by Wiley, but suggests the need to isolate the tube from the clamp to act as a wear sleeve and prevent wear from exposed fibers, which further teaches away from applicant's invention. This problem was recognized by the applicant at page 2 and 4 of his specification and is solved by the present invention.

The Examiner also relies on Alston et al. Alston et al. does not add anything to Wiley except that it is a widely used material. Applicant has already indicated in page 3 of his specification that PMR-15 is a widely used material, and even has been used for tube clamps in the hot section of engines, but not as claimed by applicant to solve the problem of wear.

Livesay et al., as understood, teaches a process for the preparation of reinforced composite structures comprising one or more layers of material by resin transfer molding utilizing a vacuum directed fabrication and utilizing a photocurable or peroxide curable matrix. First, compression molding and resin transfer molding are different processes, *see* ASM Handbook Volume 21, COMPOSITES. There is no teaching or suggestion in Wiley to combine the process of Wiley for compression molding with that of Livesay et al., which teaches resin transfer molding. Nor is there any teaching or suggestion in Wiley to substitute multiple fiber layers or sheets from Livesay et al. into the compression molding operation taught at col. 3, ll. 44-55. As stated in MPEP § 2143:

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in

applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Here, such teaching and suggestion is lacking.

Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the claim language and the prior art references as a whole. This is set out in both MPEP §2141.02, which provides:

Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole. See MPEP Section 2111 - Section 2116.01 for case law pertaining to claim interpretation.

THE CLAIMED INVENTION AS A WHOLE MUST BE CONSIDERED

In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); Schenck v. Nortron Corp., 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983) (Claims were directed to a vibratory testing machine (a hard-bearing wheel balancer) comprising a holding structure, a base structure, and a supporting means which form "a single integral and gaplessly continuous piece." Nortron argued the invention is just making integral what had been made in four bolted pieces, improperly limiting the focus to a structural difference from the prior art and failing to consider the invention as a whole. The prior art perceived a need for mechanisms to dampen resonance, whereas the inventor eliminated the need for dampening via the one-piece gapless support structure. "Because that insight was contrary to the understandings and expectations of the art, the structure effectuating it would not have been obvious to those skilled in the art." 713 F.2d at 785, 218 USPQ at 700 (citations omitted).

See also In re Hirao, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) (Claims were directed to a three-step process for preparing sweetened foods and drinks. The first two steps were directed to a process of producing high purity maltose (the sweetener), and the third was directed to adding the maltose to foods and drinks. The parties agreed that the first two steps were unobvious but formed a known product and the third step was obvious. The Solicitor argued the preamble was directed to a process for preparing foods and drinks sweetened mildly and thus the specific method of making the high purity maltose (the first two steps in the claimed process) should not be given weight, analogizing with product-by-process claims. The court held "due to the admitted unobviousness of the first two steps of the claimed combination of steps, the subject matter as a whole would not have

been obvious to one of ordinary skill in the art at the time the invention was made." 535 F.2d at 69, 190 USPQ at 17 (emphasis in original). The preamble only recited the purpose of the process and did not limit the body of the claim. Therefore, the claimed process was a three-step process, not the product formed by two steps of the process or the third step of using that product.).

DISCOVERING SOURCE/CAUSE OF A PROBLEM IS PART OF "AS A WHOLE" INQUIRY

"[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the subject matter as a whole, which should always be considered in determining the obviousness of an invention under 35 U.S.C. Section 103." In re Spinnoble, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969). However, "discovery of the cause of a problem . . . does not always result in a patentable invention. . . . [A] different situation exists where the solution is obvious from prior art which contains the same solution for a similar problem." In re Wiseman, 596 F.2d 1019, 1022, 201 USPQ 658, 661 (CCPA 1979) (emphasis in original).

In In re Spinnoble, the claim was directed to a plural compartment mixing vial wherein a center seal plug was placed between two compartments for temporarily isolating a liquid-containing compartment from a solids-containing compartment. The claim differed from the prior art in the selection of butyl rubber with a silicone coating as the plug material instead of natural rubber. The prior art recognized that leakage from the liquid to the solids compartment was a problem, and considered the problem to be a result of moisture passing around the center plug because of microscopic fissures inherently present in molded or blown glass. The court found the inventor discovered the cause of moisture transmission was through the center plug, and there was no teaching in the prior art which would suggest the necessity of selecting applicant's plug material which was more impervious to liquids than the natural rubber plug of the prior art.

In In re Wiseman, 596 F.2d at 1022, 201 USPQ at 661, claims directed to grooved carbon disc brakes wherein the grooves were provided to vent steam or vapor during a braking action to minimize fading of the brakes were rejected as obvious over a reference showing carbon disc brakes without grooves in combination with a reference showing grooves in noncarbon disc brakes for the purpose of cooling the faces of the braking members and eliminating dust, thereby reducing fading of the brakes. The court affirmed the rejection, holding that even if applicants discovered the cause of a problem, the solution would have been obvious from the prior art, which contained the same solution (inserting grooves in disc brakes) for a similar problem.

PRIOR ART MUST BE CONSIDERED IN ITS ENTIRETY, INCLUDING
DISCLOSURES THAT TEACH AWAY FROM THE CLAIMS

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) (Claims were directed to a process of producing a porous article by expanding shaped, unsintered, highly crystalline poly(tetrafluoroethylene) (PTFE) by stretching said PTFE at a 10% per second rate to more than five times the original length. The prior art teachings with regard to unsintered PTFE indicated the material does not respond to conventional plastics processing, and the material should be stretched slowly. A reference teaching rapid stretching of conventional plastic polypropylene with reduced crystallinity combined with a reference teaching stretching unsintered PTFE would not suggest rapid stretching of highly crystalline PTFE, in light of the disclosures in the art that teach away from the invention, i.e., that the conventional polypropylene should have reduced crystallinity before stretching, and that PTFE should be stretched slowly.).

Here, the claimed invention must be considered as a whole must be considered, including the limitation regarding unexposed fibers. The unexposed fibers are the solution to the problem with abrasion of tubes due to exposed fibers and is part of the "as a whole" inquiry. Furthermore, the prior art references as whole must be considered. This includes the portions that lead away from the claimed invention, which was discussed above. The analysis of the prior art references as a whole also must be considered when determining that the prior art references cannot be combined, when the references teach away from one another, also as discussed above. If the Examiner intends to persist in the position, for example, that Wiley discloses anything other than randomly oriented fiber layers, in a compression molding operation, the applicant requests, and indeed the MPEP requires, the Examiner to specifically point out such teaching or suggestion in Wiley.

Furthermore, even if the combination is proper (which it is not) all claim limitations must be taught or suggested by the prior art. MPEP §2143.03 states:

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424

F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Here, an important claim consideration is element c, which requires removing the cured material from the layup tooling without exposing the fibers. This is an important aspect as the exposed fibers, a problem with prior art composites, causes abrasion of the tube. This key claim limitation is not taught or suggested by the prior art as required.

Based on the above, applicant respectfully requests withdrawal of the rejection of claims 1-5 and 10-12 under 35 U.S.C. §103(a) based on the combination of Wiley in view of Alston et al. and further in view of Livesay et al.

Claims 6-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Wiley, Alston et al., and Livesay et al. and further in view of the admitted prior art. The Examiner states:

Wiley discloses clamp with the same thickness throughout. The admitted prior art discloses a clamp with a different thickness in different locations (Figure 1). One in the art would appreciate the method of Wiley, Alston et al. and Livesay et al. could be used to form other types of claims such as that of the admitted prior art since they are both clamps used in the airline industry and therefore have the same type of requirements. When forming clamps such as that of the admitted prior art, one in the art would appreciate that a filler would be needed between the top and bottom of the clamp as the clamp is not the same thickness throughout the fiber plies are. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use some type of filler such as fiber plies cut to shape since this would fill in the space between the top and bottom of the clamp known in the admitted prior art while using the same types of materials with the same strengths.

Applicants respectfully traverse this rejection. As previously discussed, the present invention solves the problem with abrasion in tube clamps used in applications in which there is inherent movement between the tube and the clamp, particularly abrasion from exposed fibers. Wiley, Alston et al. and Livesay et al. have been discussed above. All that has been said regarding these references is equally applicable to this rejection and will not be repeated for brevity. Furthermore, the fact that the admitted prior art may disclose the use of plies does not recognize the problem solved by the present invention as discussed. Nor does the use of filler

material, which the Examiner states is an obvious modification. That this problem is not solved by the combination suggested by the Examiner is attributable to the fact that these dependent claims include all of the limitation of independent claim 1, and adds additional limitations, claim 1 not being obvious over the cited art.

CONCLUSION

In view of the above, Applicants respectfully request entry of this amendment and reconsideration of the Application based on this amendment and withdrawal of the outstanding rejections. As a result of the amendments and remarks presented herein, Applicants respectfully submit that claims 1-12 are not rendered obvious by Wiley, Alston et al., Livesay et al. or the admitted prior art, either alone or in any combination and thus, are in condition for allowance. As the claims are not anticipated by nor rendered obvious in view of the applied art, Applicants request allowance of claims 1-12. If the Examiner is of the opinion that the limitation of claim 1 regarding the exposed fibers can be better presented in order to obtain an allowance, the Examiner is encouraged to contact applicant's attorney at the below-listed telephone number. If the Examiner believes that prosecution of this Application could be expedited by a telephone conference, the Examiner is requested to contact the Applicants.

The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to Deposit Account No. 50-1059.

Respectfully submitted,
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